MTH-4106 Factoring and Algebraic Fractions: **Worksheet #5**

Factor the following trinomials using the **product-sum method (4 step method)**:

1. $3x^2 + 14x + 8$

$p = 24$

$s = 14$

$2, 12$

$(3x^2+2x)+(12x+8)$

$x(3x+2) + 4(3x+2)$

$\boxed{(x+4)(3x+2)}$

2. $7y^2 - 19y - 6$

$p = -42$

$s = -19$

$-21, +2$

$(7y^2-21y)+(2y-6)$

$7y(y-3) + 2(y-3)$

$\boxed{(7y+2)(y-3)}$

3. $3a^2 + a - 2$

$p = -6$

$s = +1$

$+3, -2$

$(3a^2+3a)(-2a-2)$

$3a(a+1) - 2(a+1)$

$\boxed{(3a-2)(a+1)}$

4. $2x^2 - x - 1$

$p = -2$

$s = -1$

$-2, +1$

$(2x^2-2x)+(1x-1)$

$2x(x-1) + 1(x-1)$

$\boxed{(2x+1)(x-1)}$

5. $3p^2 + 10pq + 7q^2$

$p = 21$

$s = 10$

$3, 7$

$(3p^2+3pq)+(7pq+7q^2)$

$3p(p+q) + 7q(p+q)$

$\boxed{(3p+7q)(p+q)}$

6. $15 - 2b - b^2$

$p = -15$

$s = -2$

$-5, 3$

$(-b^2-5b)+(3b+15)$

$-b(b+5) + 3(b+5)$

$\boxed{(-b+3)(b+5)}$

7. $3j^2 + 8jk + 4k^2$

$p = 12$
$s = 8$
$2, 6$

$(3j^2 + 2jk) + (6jk + 4k^2)$
$j(3j + 2k) + 2k(3j + 2k)$
$(j + 2k)(3j + 2k)$

8. $3x^2 + 41xy + 26y^2$

$p = 78$
$s = 41$
$2, 39$

$(3x^2 + 2xy) + (39xy + 26y^2)$
$x(3x + 2y) + 13y(3x + 2y)$
$(x + 13y)(3x + 2y)$

9. $-3x^2 + 10xy - 3y^2$

$p = +9$
$s = 10$
$9, 1$

$(-3x^2 + 9xy) + (1xy - 3y^2)$
$-3x(x - 3y) + y(x - 3y)$
$(-3x + y)(x - 3y)$

10. $3a^2 - 10ab + 3b^2$

$p = 9$
$s = -10$
$-9, -1$

$(3a^2 - 9ab) + (-1ab + 3b^2)$
$3a(a - 3b) - b(a - 3b)$
$(3a - b)(a - 3b)$

11. $-b^2 - b + 20$

$p = -20$
$s = -1$
$-5, +4$

$(-b^2 - 5b) + (4b + 20)$
$-b(b + 5) + 4(b + 5)$
$(-b + 4)(b + 5)$

12. $2x^2 - 7xy + 5y^2$

$p = 10$
$s = -7$
$-2, -5$

$(2x^2 - 2xy) + (-5xy + 5y^2)$
$2x(x - y) - 5y(x - y)$
$(2x - 5y)(x - y)$

13. $8a^2 - 14ab + 3b^2$

$p = 24$

$s = -14$

$-2, -12$

$(8a^2 - 2ab)(-12ab + 3b^2)$

$2a(4a - b) - 3b(4a - b)$

$(2a - 3b)(4a - b)$

14 $5a^2 - 26ab + 5b^2$

$p = 25$

$s = -26$

$-25, -1$

$(5a^2 - 25ab)(-1ab + 5b^2)$

$5a(a - 5b) - b(a - 5b)$

$(5a - b)(a - 5b)$

15. $9y^2 - 6y + 1$

$p = 9$

$s = -6$

$-3, -3$

$(9y^2 - 3y)(-3y + 1)$

$3y(3y - 1) - 1(3y - 1)$

$(3y - 1)(3y - 1)$

16. $3x^2 - 13x + 4$

$p = 12$

$s = -13$

$-12, -1$

$(3x^2 - 12x)(-1x + 4)$

$3x(x - 4) - 1(x - 4)$

$(3x - 1)(x - 4)$

17. $6t^2 - 19t + 3$

$p = 18$

$s = -19$

$-18, -1$

$(6t^2 - 18t)(-1t + 3)$

$6t(t - 3) - 1(t - 3)$

$(6t - 1)(t - 3)$

18. $15a^2 - 13ab + 2b^2$

$p = 30$

$s = -13$

$-3, -10$

$(15a^2 - 3ab)(-10ab + 2b^2)$

$3a(5a - b) - 2b(5a - b)$

$(3a - 2b)(5a - b)$

19. $4x^2 - 17xy + 4y^2$

$p = 16$
$s = -17$
$-16, -1$

$(4x^2 - 16xy) + (-1xy + 4y^2)$
$4x(x - 4y) - y(x - 4y)$
$\boxed{(4x - y)(x - 4y)}$

20. $-b^2 - b + 6$

$p = -6$
$s = -1$
$-3, +2$

$(-b^2 - 3b) + (2b + 6)$
$-b(b + 3) + 2(b + 3)$
$\boxed{(-b + 2)(b + 3)}$

21. $2x^2 - 5xy + 2y^2$

$p = 4$
$s = -5$
$-4, -1$

$(2x^2 - 4xy) + (-1xy + 2y^2)$
$2x(x - 2y) - y(x - 2y)$
$\boxed{(2x - y)(x - 2y)}$

22. $3x^2 - 7x + 2$

$p = 6$
$s = -7$
$-6, -1$

$(3x^2 - 6x) + (-1x + 2)$
$3x(x - 2) - 1(x - 2)$
$\boxed{(3x - 1)(x - 2)}$

23. $-2x^2 + 13x - 15$

$p = 30$
$s = 13$
$3, 10$

$(-2x^2 + 3x) + (10x - 15)$
$-x(2x - 3) + 5(2x - 3)$
$\boxed{(-x + 5)(2x - 3)}$

24. $-4y^2 + 9xy - 2x^2$

$p = 8$
$s = 9$
$8, 1$

$(-4y^2 + 8xy) + (1xy - 2x^2)$
$-4y(y - 2x) + x(y - 2x)$
$\boxed{(-4y + x)(y - 2x)}$

25. $2b^2 + 5b + 2$

$p = 4$
$s = 5$
$4, 1$

$(2b^2 + 4b) + (1b + 2)$
$2b(b+2) + 1(b+2)$
$\boxed{(2b+1)(b+2)}$

26. $2x^2 + 7x + 3$

$p = 6$
$s = 7$
$6, 1$

$(2x^2 + 6x) + (1x + 3)$
$2x(x+3) + 1(x+3)$
$\boxed{(2x+1)(x+3)}$

27. $2a^2 + 9a + 4$

$p = 8$
$s = 9$
$8, 1$

$(2a^2 + 8a) + (1a + 4)$
$2a(a+4) + 1(a+4)$
$\boxed{(2a+1)(a+4)}$

28. $2 + 9x - 18x^2$

$-18x^2 + 9x + 2$

$p = -36$
$s = +9$
$12, -3$

$(-18x^2 + 12x) + (3x + 2)$
$-6x(3x-2) - 1(3x-2)$
$\boxed{(-6x-1)(3x-2)}$

29. $-12x^2 - xy + y^2$

$p = -12$
$s = -1$
$-4, +3$

$(-12x^2 - 4xy) + (3xy + y^2)$
$-4x(3x+y) + y(3x+y)$
$\boxed{(-4x+y)(3x+y)}$

30. $2x^2 + 9x + 9$

$p = 18$
$s = 9$
$3, 6$

$(2x^2 + 3x) + (6x + 9)$
$x(2x+3) + 3(2x+3)$
$\boxed{(x+3)(2x+3)}$

31. $4y^2 - 4y + 1$

$p = 4$

$s = -4$

$-2, -2$

$(4y^2 - 2y)(-2y + 1)$

$2y(2y - 1) - 1(2y - 1)$

$\boxed{(2y-1)(2y-1)}$

32. $-7x^2 - 13xy + 2y^2$

$p = -14$

$s = -13$

$-14, +1$

$(-7x^2 - 14xy)+(1xy + 2y^2)$

$-7x(x + 2y) + y(x + 2y)$

$\boxed{(-7x+y)(x+2y)}$

33. $1 - 3m + 2m^2$

$p = 2$

$s = -3$

$-2, -1$

$(2m^2 - 2m)(-1m + 1)$

$2m(m-1) - 1(m-1)$

$\boxed{(2m-1)(m-1)}$

34. $-6x^2 + xy + 2y^2$

$p = -12$

$s = +1$

$+4, -3$

$(-6x^2 + 4xy)(-3xy + 2y^2)$

$-2x(3x-2y) - y(3x - 2y)$

$\boxed{(-2x-y)(3x-2y)}$

35. $6 - 7t + 2t^2$

$p = 12$

$s = -7$

$-3, -4$

$(2t^2 - 3t)(-4t + 6)$

$t(2t-3) - 2(2t-3)$

$\boxed{(t-2)(2t-3)}$

36. $19a + 5 - 4a^2$

$-4a^2 + 19a + 5$

$p = -20$

$s = 19$

$20, -1$

$(-4a^2 + 20a)(-1a + 5)$

$4a(-a+5) + 1(-a+5)$

$\boxed{(4a+1)(-a+5)}$

37. $10x^2 - x - 2$

$p = -20$

$s = -1$

$-5, +4$

$(10x^2 - 5x) + (4x - 2)$

$5x(2x - 1) + 2(2x - 1)$

$\boxed{(5x + 2)(2x - 1)}$

38. $-8a^2 + 6ab - b^2$

$p = 8$

$s = 6$

$2, 4$

$(-8a^2 + 2ab) + (4ab - b^2)$

$2a(-4a + b) - b(-4a + b)$

$\boxed{(2a - b)(-4a + b)}$

39. $-x^2 - 2x - 1$

$p = 1$

$s = -2$

$-1, -1$

$(-x^2 - 1x)(-1x - 1)$

$-x(x + 1) - 1(x + 1)$

$\boxed{(-x - 1)(x + 1)}$

40. $1 - 16y + 64y^2$

$p = 64$

$s = -16$

$-8, -8$

$(64y^2 - 8y)(-8y + 1)$

$8y(8y - 1) - 1(8y - 1)$

$\boxed{(8y - 1)(8y - 1)}$

41. $5j^2 - 6j - 8$

$p = -40$

$s = -6$

$-10, +4$

$(5j^2 - 10j) + (4j - 8)$

$5j(j - 2) + 4(j - 2)$

$\boxed{(5j + 4)(j - 2)}$

42. $12c^2 - 23cd + 10d^2$

$p = 120$

$s = -23$

$-8, -15$

$(12c^2 - 8cd)(-15cd + 10d^2)$

$4c(3c - 2d) - 5d(3c - 2d)$

$\boxed{(4c - 5d)(3c - 2d)}$